DECLARATION

I, Hideko SUEOKA, a subject of Japan residing at 4-31-20, Koenji-kita, Suginami, Tokyo, 166-0002 Japan, solemnly and sincerely declare:

That I have thorough knowledge of Japanese and English languages; and

That the attached pages contain a correct translation into English of the specification of the following Japanese Patent Application:

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Signed this 13th day of March, 2007

Hideko SUEOKA

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[List of Documents Attached]

[Name of Document]	Specification	1
[Name of Document]	Drawings	1
[Name of Document]	Abstract	1
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[Proof]		Required

[Name of Document] SPECIFICATION

[Title of the Invention] ENDOSCOPE

[Claims]

[Claim 1] An endoscope comprising:

an elongated inserting portion;

a grip portion that is arranged on the base end side of the inserting portion and that is capable of being gripped by an operator;

an objective optical system that is arranged to an edge portion of the inserting portion and that can transmit an optical image of a subject into the inserting portion;

image guiding fibers that can transmit the optical image incident from the edge side via the objective optical system and that is inserted to the inserting portion so that the base end side extends in the grip portion from the inserting portion;

an optical system output portion that is arranged on the base end side of the image guiding fibers and that outputs the optical image transmitted from the edge side; and

an image pickup unit that is optically connected to the optical image output portion and that can pick up the optical image transmitted from the optical image output portion,

wherein the optical axis of the optical image output to the image pickup unit from the optical image output portion is deviated from the central axis of a portion at that the image guiding fibers are extended in the grip portion.

[Claim 2] The endoscope according to Claim 1, further comprising:

adjusting and fixing means that can adjust the amount of deflection of the image guiding fibers and that fixes the image pickup unit.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to an endoscope having an image pickup unit, preferable to an inserting portion with a thin diameter.

[0002]

[Description of the Related Art]

In recent years, an endoscope has widely been used in medical and industrial fields. Further, an endoscope is commonly used, having therein an image pickup unit incorporating an image pickup device that simply records an endoscope image obtained by the endoscope and easily edits and reuses it.

A micro-sized image pickup device is developed. In the case of an endoscope having an inserting portion with a thin diameter for the bronchi, the image pickup device is arranged at the edge portion of the inserting portion and then the outer diameter of the inserting portion is larger.

[0003]

Therefore, a well-known art disclosed in Japanese Unexamined Patent Application Publication No. 11-151200 discloses an endoscope in which an optical image of a subject is formed onto an image pick-up surface of an image pickup device in a grip portion having the rear end of an optical fiber for transmitting an image, which is inserted in an inserting portion to be inserted into the eyeball.

According to the well-known art, the optical fiber inserted in the inserting portion is arranged so that it is extended substantially straight in the grip portion, and the optical image of the subject is formed onto the image pickup device via a projecting lens facing the optical fiber.

[0004]

In the case of a so-called soft endoscope having a soft inserting portion and a hard endoscope having a hard inserting portion, the endoscope having a mechanism for bending the edge portion of the inserting portion includes an optical fiber for transmitting the image that is generally designed with flexure in consideration of the following points.

[0005]

· Upon bending the inserting portion or edge portion of the optical fiber, the excessive stretch and the resultant damage of the optical fiber is prevented.

[0006]

· The variation in length of the optical fiber or the inserting portion is

absorbed.

[0007]

· A channel tube for absorbing and supplying air and solution, or a wire for bending is prevented.

[0008]

· The optical fiber upon assembly is easily attached.

[0009]

However, as compared with a general fiber scope having the end of the optical fibers are fixed at an eyepiece continuously arranged to the inserting portion, the grip portion, and a (bending) operating portion, in the endoscope having the end of the optical fibers, fixed in the grip portion continuously arranged to the inserting portion as according to the well-known art, the distance from the portion out of the inserting portion, of the end of the optical fibers, to the fixed portion thereof is short. Thus, the space for absorbing the bending of the optical fibers is reduced. On the other hand, even if the space for absorbing the bending of the optical fibers is increased by raising the internal dimension of the grip portion, it is limited that the ease of gripping of the grip portion itself should not be lost.

[0010]

[Patent Document 1]

Japanese Unexamined Patent Application Publication No. 11-151200

[0011]

[Problems to be Solved by the Invention]

As mentioned above, the variation in lengths of the optical fibers needs to be suppressed as much as possible and manufacturing costs of the optical fibers are increased because the space for observing the amount of deflection of the optical fibers is not sufficiently ensured. Further, even if it is possible to set a state in which the image can be formed by adjusting the rear end, of the optical fibers and the positions of the image pickup lens and image pickup device, when the inserting portion is bent with an insufficient amount of deflection of the optical fibers, large force is operated to the fixed portion of the read end of the optical fibers. As a

consequence, there are drawbacks that the optical fibers are damaged, the durability easily deteriorates, the deterioration of an image transfer function due to the drawbacks easily degrades the image pickup characteristics, and the even the case of moving the rear end of the optical fibers lowers the image pickup characteristics.

[0012]

(Object of the Invention)

The present invention is devised in consideration of the above-mentioned points and it is an object of the present invention to an endoscope that ensures the amount of deflection of optical fibers with a simple structure, easily holds a predetermined image pickup function, and has preferable assembly performance.

[0013]

[Means for Solving the Problems]

An endoscope comprises:

an elongated inserting portion;

a grip portion that is arranged on the base end side of the inserting portion and that is capable of being gripped by an operator;

an objective optical system that is arranged to an edge portion of the inserting portion and that can transmit an optical image of a subject into the inserting portion;

image guiding fibers that can transmit the optical image incident from the edge side via the objective optical system and that is inserted to the inserting portion so that the base end side extends in the grip portion from the inserting portion;

an optical system output portion that is arranged on the base end side of the image guiding fibers and that outputs the optical image transmitted from the edge side; and

an image pickup unit that is optically connected to the optical image output portion and that can pick up the optical image transmitted from the optical image output portion.

In the endoscope, the optical axis of the optical image output to the image pickup unit from the optical image output portion is deviated from the central axis of a portion at that the image guiding fibers are extended in the grip portion. With this

arrangement of the image pickup unit, as compared with the case of the coaxial image guide fibers, the operation of tension to the image guide fibers is solved or reduced, when a large deflection portion is smoothly formed with a portion reaching the output end portion of the image guide fibers and the inserting portion thus is bent. In addition, the deflection portion absorbs the influence of the variation in image guide fibers, thereby holding a predetermined image pickup function.

[0014]

[Description of the Embodiments]

Hereinbelow, a description will be given of embodiments of the present invention with reference to the drawings.

(First embodiment)

Figs. 1 to 5 relate to the first embodiment. Fig. 1 shows the appearance of an endoscope according to the first embodiment, Fig. 2 shows the internal configuration of an inserting portion on the edge side thereof, Fig. 3 shows examples of the internal configuration and the like of an operating portion, Fig. 4(A), 4(B), and 4(C) show enlarged cross-sectional views of an A-A cross section, a B-B cross-section, and a C-C cross-section shown in Fig. 3, and Fig. 5 shows an image pickup unit portion enlarged, shown in Fig. 3.

[0015]

Referring to Fig. 1, an endoscope 1 according to the first embodiment of the present invention comprises an elongated inserting portion 2 with flexure, which is inserted in the body cavity, an operating portion 3 arranged at the rear end of the inserting portion 2, a universal cord 4 extended at the base end (near end) from the side portion of the operating portion 3, and a connector 5 arranged to the end (far end) of the universal cord 4. A light guiding cap 6 is projected from the end of the connector 5, and is attached to a light source device (not shown). Thus, illumination light is supplied from the light source device and the illumination light is transmitted by light guiding fibers inserted in the endoscope 1. The light is output from an illumination window at the end (edge) of the inserting portion 2 and an examination target portion such as the affected part is illuminated.

[0016]

Further, an electric connector portion 7 is arranged on the side surface of the connector 5. The electric connector portion 7 is attached to a video processor via a connecting cable (not shown) attached thereto, and the video processor is thus electrically connected to a solid-state image pickup device, which will be described later, included in the endoscope 1. The video processor applies a driving signal to the solid-state image pickup device, performs the signal processing of an image pick-up signal picked up by the solid-state image pickup device, and generates a video signal. The video processor further outputs the generated video signal to a monitor (not shown), and displays an image picked up by the solid-state image pickup device on a display surface of the monitor.

[0017]

A hard edge portion 8, a bending portion 9 that is freely bent, and a flexible portion 10 with flexibility are sequentially arranged from the edge side of the inserting portion 2, and the rear end of the flexible portion 10 reaches the operating portion 3. The operating portion 3 has, on the front end side thereof, a grip portion 11 that is gripped by an operator. The grip portion 11 includes, at the front end thereof, a connecting member for connection to the inserting portion 2.

[0018]

A bending lever 12 is arranged on the rear side (upper end or the top portion) of the grip portion 11 so that the grip portion 11 is operated by the gripping hand. The bending lever 12 is operated, the bending portion 9 is bent, and the edge portion 8 is thus vertically bent. The endoscope 1 according to the first embodiment has the structure of the bending portion 9 that can be bent only in the vertical direction so that the inserting portion 2 has the thin diameter. A video switch portion 13 is arranged at the rear end of the operating portion 3 for the remote operation of freeze and release, on the video processor side.

[0019]

An inserting slit 14 of a treatment tool such as a clamp is arranged near the front end of the grip portion 11. The treatment tool inserted from the inserting slit 14

can be inserted in a channel arranged in the longitudinal direction of the inserting portion 2.

[0020]

Light guiding fibers (not shown) and a signal cable connected to the image pickup device are inserted into the universal cord 4 extended in the direction perpendicular to the side surface of the operating portion 3 therefrom.

[0021]

Next, the configuration of the inserting portion 2 on the edge side thereof will be described with reference to Fig. 2.

Referring to Fig. 2, the edge portion 8 is formed by an edge portion main body 16 that is made of a hard member such as metal with substantially cylindrical shape. A plurality of holes are provided in the axial direction of the edge portion main body 16, and the holes are fixedly filled with various components.

[0022]

For example, an objective lens system (objective optical system) 18 is fixed to the hole of an observing window via a lens frame 17 or the like. Edge surfaces of image guiding fibers 19 having a function of transmitting means of an optical image (optical information) are fixed at the position for forming the image of the objective lens system 18. The image guiding fibers 19 transmit the optical image formed onto the edge surface thereof to a rear end surface (output end surface) arranged in the operating portion 3.

[0023]

The edge of a flexible tube 21 forming a channel 20 inserted in the inserting portion 2 is fixed to the rear end of the hole provided adjacently to the observing window via a cap member 22. The rear end side of the channel 20 is branched in the halfway, one branched channel 20 is connected to the inserting slit 14, and the other branched channel 20 is extended to the rear end side of the operating portion 3. The edge of the channel 20 is opened via the hole of the edge portion main body 16.

[0024]

Light guiding fibers (not shown) are inserted in the inserting portion 2 and the

edges of the light guiding fibers are fixed to the hole for illuminating window of the edge portion main body 16, and output illumination light from the fixed edge surface. The light illuminates the subject within the observing range of the objective lens system 18.

[0025]

A bending piece (node ring) 23 at the last end with substantially circular shape is fixed to the rear end of the edge portion main body 16, and the edge of the bending piece 23 as the succeeding one is rotatably connected to the rear end of the bending piece 23 via a rotating and connecting member using a rivet 24 or the like at the position in a predetermined direction such as the right or left direction. Thus, the many bending pieces 23 are rotatably connected in the longitudinal direction of the inserting portion 2 and the bending portion 9 is formed.

[0026]

A pair of bending wires 25 is inserted along the position apart from the connecting position using the rivet 24, for example, the position in the vertical direction, and the edge of the bending wire 25 is strongly fixed to the endmost bending piece 23 by waxing.

[0027]

The rear ends of the pair of bending wires 25 are fixed to a drum 32a forming a drum unit 32 as a bending mechanism of the operating portion 3. The drum 32a is rotated by rotating the bending lever 12, extends one of the pair of the bending wires 25, and releases the other of the pair of the bending wires 25. Thus, the bending portion 9 is bent to the bending wire 25 side on the extended side.

Referring to Fig. 2, the bending portion 9 is covered with a net tube 28 and a bending rubber tube 29 made of elastic resin that covers the outside of the net tube 28.

[0028]

Next, a description is given of the operating portion 3 and the grip portion 11 with reference to Figs. 3 to 5.

An exterior member of the operating portion 3 comprises an exterior member

31 of the grip portion that covers the grip portion 11 on the front end side of the operating portion 3, and exterior members 32 of the operating portion main body that cover the operating portion main body on the rear end side. The exterior members 31 and 32 are connected at a connecting portion 33 for fitting them each other via a watertight stick member such as an O ring 34.

[0029]

A substantially-plate frame 45 is arranged in the exterior member 31 of the grip portion (hereinafter, abbreviated to the exterior member) as the internal structure for ensuring predetermined strength. One end (rear end) of the frame 35 in the longitudinal direction is bent like L and is fixed by a screw (not shown) to the exterior members 32 of the operating portion main body in the connecting portion 33, and another end reaches near the front end of the grip portion 11.

[0030]

A branch member (not shown) branched to the inserting slit 14 side and an absorbing tube 36 side indicating the cross section extended to the operating portion 3 side shown in Fig. 4(C) is fixed near the front end of the frame 35.

[0031]

Further, an exterior member of the inserting portion 2 is formed. The image guiding fibers 19 are inserted into a hollow portion of a flexible tube 37. The rear end of the flexible tube 37 is connected to the exterior member 31 near the front end of the grip portion 11 via a connecting member 38.

[0032]

Further, a bending preventing member 39 taper-shaped with the larger thickness on the rear side prevents the sharp bending of the boundary of the grip portion 11 at the rear end of the flexible tube 37.

[0033]

The image guiding fibers 19 with the flexibility inserted in the inserting portion 2 are inserted along the substantially the central axis of a flexible tube 37, and are substantially straight extended on the rear side as shown by the central line as a one-dotted line C by the bending preventing member 39 taper-shaped near the rear

end of the inserting portion 2 (in the state in which the large bending is suppressed).

[0034]

According to the first embodiment, the image guiding fibers 19 are substantially straight extended toward the grip portion 11 side on the back as shown by the one-dotted line C in the bending preventing member 39 that is taper-shaped near the rear end of the inserting portion 2. The output end portions of the image guiding fibers 19 at the rear ends (base ends) thereof are fixed while a deflection portion (play portion) 42 is formed to an image pickup unit 41 attached to the grip potion 11 deviated from the substantially straight line shown by the one-dotted line C.

[0035]

That is, referring to Fig. 3, a notch portion 35a is arranged in the grip portion 11. The notch portion 35a is notched from the side perpendicular to the longitudinal direction of the substantially-rectangular frame 35 on the rear end side, extended elongated in the longitudinal direction. The cylindrical image pickup unit 41 is arranged to the notch portion 35a. Referring to Figs. 4(A) and 4(B), the image pickup unit 41 is fixed (to the frame 35) via an L-shaped attaching member 45 attached to the frame 35 using a screw 44a.

[0036]

According to the first embodiment, the frame 35 arranged substantially in the center of the grip portion 11 is partly notched from the side (on the upper side shown in Fig. 3), and the image pickup unit 41 is arranged and fixed to the notch portion 35a formed at the position deviated from the center of the grip portion 11 in the longitudinal direction.

[0037]

Referring to Fig. 5, the image pickup unit 41 is enlarged. The image pickup unit 41 comprises a cylindrical hard fiber supporter 46 that holds a hard cap 43 portion such as metal for protecting the output end portion at the rear end of the image guiding fibers 19, a relay optical system 47 that is arranged facing output end surfaces 19a of the image guiding fibers 19 and that includes a function for forming the optical image transmitted to the output end surface 19a with a desired

magnification, and an image pick-up portion 49 that is arranged at the position for forming the image with predetermined size by the relay optical system 47 and that has a charge coupled device (abbreviated to a CCD) 48 as a solid-state image pickup device having a photoelectrically converting function. A signal cable 50 is extended to the back side from the rear end of the image pickup unit 49.

[0038]

According to the first embodiment, the relay optical system 47 for forming the image with desired size is used. For the purpose of low costs, an image forming optical system may be used with a function for forming an optical image transmitted to the rear end surface 19a of the image guiding fibers 19 with predetermined size.

[0039]

A fiber supporter 46 holds the cap 43 portion near the rear end of the image guiding fibers 19, and is fixed to a fixing frame 51 arranged to the outer periphery at two positions in the longitudinal direction. For example, referring to Fig. 4(B), one end portion of the fiber supporter 46 is adjusted for its position and is fixed at the three screws 52 in three peripheral directions. Referring to Fig. 5, positions near another end of the fiber supporter 52 are fixed at screws 52' at three positions in the peripheral direction.

[0040]

Referring to Fig. 4(A), the fixing frame 51 is fixed to an outer frame 53 on the outer peripheral side by a screw 54. The fixing frame 51 of the image pickup unit 41 is fixed to an L-shaped attaching member 45 by a screw 44b.

[0041]

The relay optical system 47 faces the output end surfaces 19a (refer to Fig. 5) of the image guiding fibers 19 held by the fiber supporter 46, and is attached to a lens frame 56. The front end side of the lens frame 56 is fit into the outer frame 53, and a CCD frame 48a of a CCD 48 is adjusted and is fixed on the rear end side of the lens frame 56. That is, the CCD frame 48a is fixed to the lens frame 56 while the relay optical system 47 adjusts the CCD frame 48a so that the image pick-up surface of the CCD 48 is at the position for forming the optical image of the relay optical system 47

with predetermined size.

[0042]

A portion at which the lens frame 56 is fit into the outer frame 53 is fixed by adjusting the focusing of the relay optical system 47 in the optical axis direction by using a screw 57. The optical image transmitted to the output end surfaces 19a of the image guiding fibers 19 is adjusted so that it is formed onto the image pick-up surface of the CCD 48 via the relay optical system 47 clearly with predetermined size. Then, the image pickup unit is attached, by using an attaching member 45, near the notch portion 35a that is formed by notching the frame 35.

[0043]

In this case, the fixing position of the fiber supporter 46 is adjusted, by using the screw 52, from three directions as peripheral directions. On the output end surfaces 19a of the image guiding fibers 19, a central axis O' of the output end surfaces 19a of the image guide fibers 19 is attached to the frame 35 via the attaching member 45 so as to match an optical axis O of the relay optical system 47.

[0044]

Referring to Fig. 4(C) as the C-C cross section of Fig. 3, inserted into the grip portion 11 are the image guiding fibers 19, and components such as the absorbing tube 36 and the coil as a guiding member into which the wire 25 for bending operation is inserted. The coil and the like are held by a coil supporter 59 fixed to the frame 35 at the position shown in Fig. 4(C). Referring to Figs. 4(A) to 4(C), the frame 35 has the end portion on the bottom in the drawing that is L-bent, with predetermined strength in the direction vertical to the plate surface.

[0045]

According to the first embodiment, the output end portions of the image guiding fibers 19 inserted in the inserting portion 2 are fixed to the fiber supporter 46 of the image pickup unit 41 partly fixed to the deviated position from the center position in the grip portion 11, not so that the image guiding fibers 19 are straightly extended, but so that the deflection portion 42 that is smoothly bent from the straight state (and a space portion for freely modifying the deflection portion 42) is formed.

[0046]

That is, referring to Fig. 3, the image guiding fibers 19 are extended along substantially the center line C on the back from the base end portion of the inserting portion 2, and are fixed to the image pickup unit 41 via the portion bent by the deflection portion 42 in the grip portion 11 so that the rear end portions of the image guiding fibers 19 are on the central axis O'.

[0047]

As mentioned above, the image pickup unit 41 is adjusted and then is attached in the grip portion 11. After attaching the image pickup unit 41, it is finely adjusted.

Thus, according to the first embodiment, referring to Figs. 3 and 4(B), the screws 52 in the three directions are easily adjusted by a driver (not shown) via the opening arranged to the outer frame 53.

In this case, referring to Fig. 3, the image pickup unit 41 is arranged at the position deviated from the center of the grip portion 11 by the notch portion 35a. As compared with the case in which the image pickup unit 41 is arranged substantially in the center, the working for fine adjustment becomes easy without the obstacle of the components. The screw 57 for fixing the lens frame 56 and the outer frame 53 can easily be fixed by the re-arrangement.

[0048]

According to the first embodiment, the front and rear ends of the image guiding fibers 19 are fixed, therebetween, specifically, in the grip portion 11, the deflection portion 42 is formed. The inserting portion 2 is curved or bent and tension acts at the front and rear ends of the image guiding fibers 19, then, the image guiding fibers 19 are modified at the position of the deflection portion 42, the tension is absorbed, and it does not act to the image guiding fibers 19. In the image pickup unit 41, a predetermined image pick-up function is maintained.

[0049]

For example, the bending operation is repeated and the tension is to act to the front and rear ends of the image guiding fibers 19 in accordance with the bending operation and, then, the modification of the image guiding fibers 19 at the position of

the deflection portion 42 solves the influence from the tension or reduces it. The predetermined image pick-up function is maintained for a long time period with the simple structure.

[0050]

If the lengths in the image guiding fibers 19 vary in the manufacturing, the change in the amount of deflection of the deflection portion 42 fixes the image guiding fibers 19 without changing the fixing position in the grip portion 11. That is, the allowable varying amount is increased for the lengths of the image guiding fibers 19 and the manufacturing costs are reduced.

[0051]

Further, the deviation of the central axis enables the image pickup unit 41 fixedly having the image guiding fibers 19 to be attached to the frame 35 while easily avoiding other components such as the coil serving as the guiding member into which the absorbing tube 36 or the wire 25 is inserted. Upon assembly, the danger to bend the image guiding fibers is reduced.

[0052]

(Second embodiment)

Next, the second embodiment of the present invention will be described with reference to Fig. 6.

As mentioned above according to the first embodiment, the formation for the deflection portion 42 solves or suppresses the influence from the bending of the inserting portion 2 or from the variation in lengths of the image guiding fibers 19. Further, the image pickup unit 41 may be fixed to the frame 35 by adjusting the amount of deflection of the image guiding fibers 19, which will be described hereinbelow.

[0053]

Fig. 6 shows a view of the attaching member 45 in the bottom direction on the sheet in Fig. 5 (a state inverse to the right and left for the purpose of the same direction of the right and left in Fig. 5). Referring to Fig. 6, the attaching member 45 has long holes 61 that are long in the longitudinal direction (right and left direction in

Fig. 6) of the grip portion 11. The long holes 61 adjust the position for fixing the image pickup unit 41 to the frame 35 by the screw 44a via the attaching member 45 like L (in the longitudinal direction of the grip portion 11).

[0054]

The attaching member 45 may be fixed to the frame 35 at the position near the rear end of the grip portion 11, that is, at the position near the left in Fig. 6 so as to decrease the amount of deflection. On the contrary, the attaching member 45 may be fixed to the frame 35 at the position near the front end of the grip portion 11, that is, at the position near the right in Fig. 6 so as to increase the amount of deflection. A screw hole is formed to which the screw 44a is screwed on the frame 35 side.

[0055]

If the lengths of the image guiding fibers 19 vary, the same amount of deflection is set for the products depending on the fixing position of the attaching member 45 to fix the image pickup unit 41.

According to the second embodiment, in addition to the advantages according to the first embodiment, the variation in lengths of the image guiding fibers 19 is absorbed and the amount of deflection is properly adjusted. Advantageously, the endoscope is provided without bending the image guiding fibers and reducing manufacturing costs thereof.

[0056]

[Advantages]

As described above, according to the present invention, an endoscope comprises:

an elongated inserting portion;

a grip portion that is arranged on the base end side of the inserting portion and that is capable of being gripped by an operator;

an objective optical system that is arranged to an edge portion of the inserting portion and that can transmit an optical image of a subject into the inserting portion;

image guiding fibers that can transmit the optical image incident from the edge side via the objective optical system and that is inserted to the inserting portion

so that the base end side extends in the grip portion from the inserting portion;

an optical system output portion that is arranged on the base end side of the image guiding fibers and that outputs the optical image transmitted from the edge side; and

an image pickup unit that is optically connected to the optical image output portion and that can pick up the optical image transmitted from the optical image output portion.

In the endoscope, the optical axis of the optical image output to the image pickup unit from the optical image output portion is deviated from the central axis of a portion at that the image guiding fibers are extended in the grip portion. With this arrangement of the image pickup unit, as compared with the case of the coaxial image guide fibers, the operation of tension to the image guide fibers is solved or reduced when a large deflection portion is smoothly formed with a portion reaching the output end portion of the image guide fibers and the inserting portion thus is bent. In addition, the image guide fibers cannot be easily broken and the deflection portion absorbs the influence of the variation in image guide fibers, thereby reducing the manufacturing costs of the image guide fibers and holding a predetermined image pickup function.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a perspective view showing the appearance of an endoscope according to the first embodiment of the present invention.

[Fig. 2]

Fig. 2 is a cross-sectional view showing the internal configuration of an inserting portion on the edge side thereof.

[Fig. 3]

Fig. 3 is a cross-sectional view showing the internal configuration of the periphery of a grip portion in an operating portion.

[Fig. 4]

Fig. 4 is an enlarged cross-sectional views of an A-A cross section, a B-B

cross-section, and a C-C cross-section shown in Fig. 3.

[Fig. 5]

Fig. 5 is a cross-sectional view showing an image pickup unit portion enlarged, shown in Fig. 3.

[Fig. 6]

Fig. 6 is a side view showing an attaching member for attaching an image pickup unit according to the second embodiment of the present invention.

[Reference Numerals]

1: endoscope

2: inserting portion

3: operating portion

4: universal cord

5: connector

8: edge portion

9: bending portion

10: flexible portion

11: grip portion

12: bending lever

18: objective pens system

19: image guide fibers

20: channel

31: exterior member

35: frame

35a: notch portion

41: image pickup unit

42: deflection portion

43: cap

45: attaching member

46: fiber supporter

47: relay optical system

48: CCD

48a: CCD frame

50: signal cable

51: fixing frame

53: outer frame

56: lens frame

Patent Attorney: Susumu ITO

[Name of Document] ABSTRACT

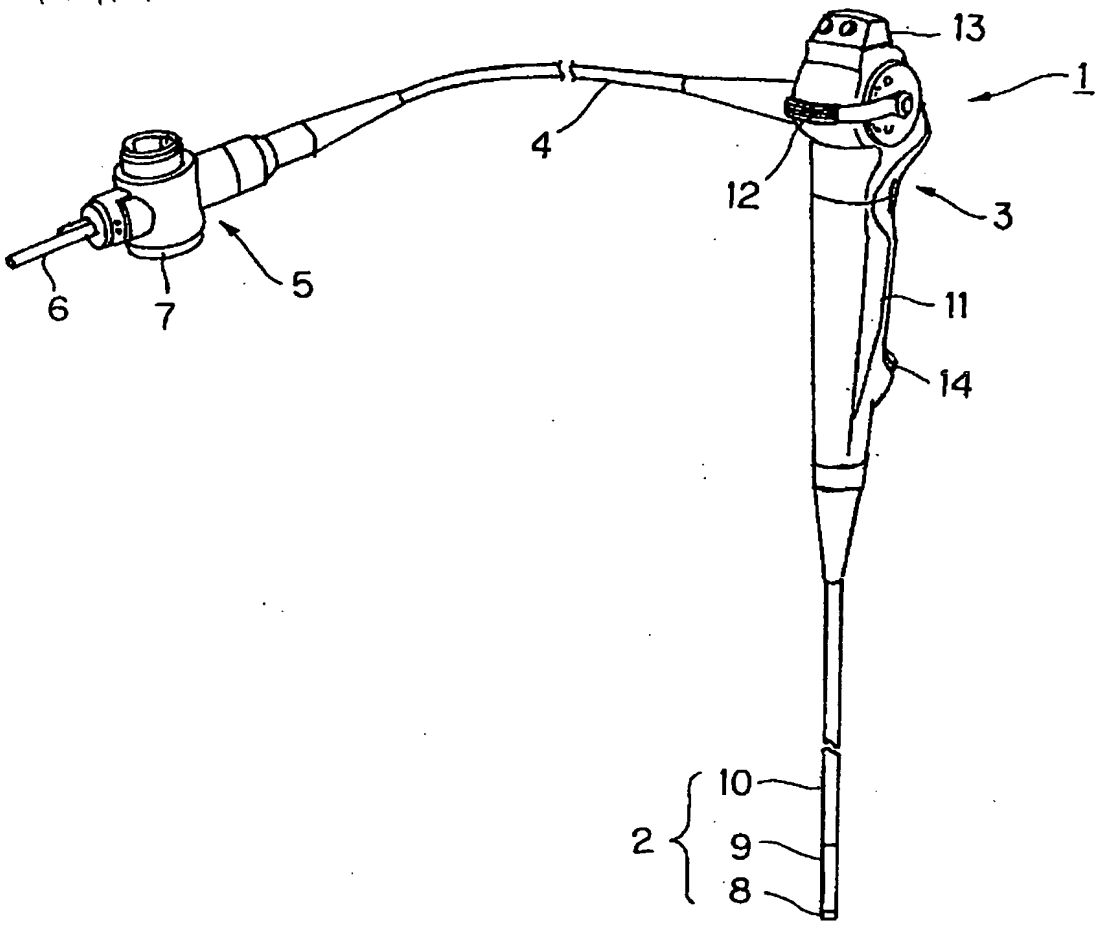
[Abstract]

[Object] To provide an endoscope that can hold a predetermined image pickup function with a simple structure.

[Solving Means] Image guiding fibers 19 are inserted in an inserting portion 2 and are straightly extended to a grip portion 11 side from the base end thereof, as shown by a central axis C. The output end portions of the image guiding fibers 19 are fixed to an image pickup unit 41 fixed to the deviated position from the central axis C so that a deflection portion 42 is formed to be slightly deflected from the direction thereof and to be freely modified. As a consequence, if the inserting portion 2 is bent, a predetermined image pickup function of the image pickup unit 41 can be held by preventing the operation of high tension to the image guide fibers 19.

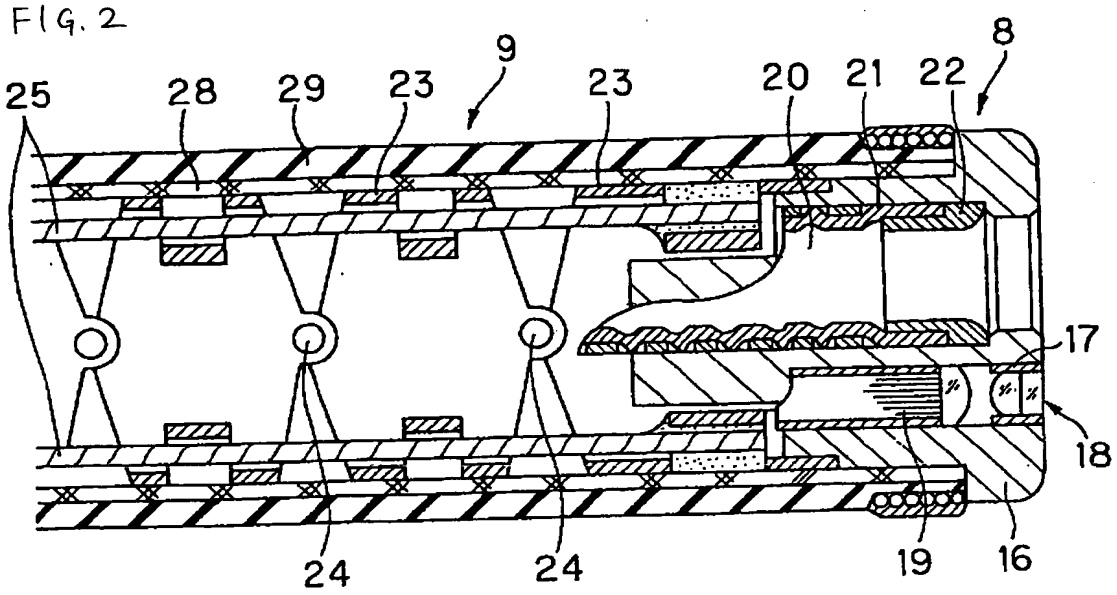
[Selected Figure] Fig. 3

【書類名】　図面　DRAWINGS
NAME OF THE DOCUMENT
【図１】
FIG. 1

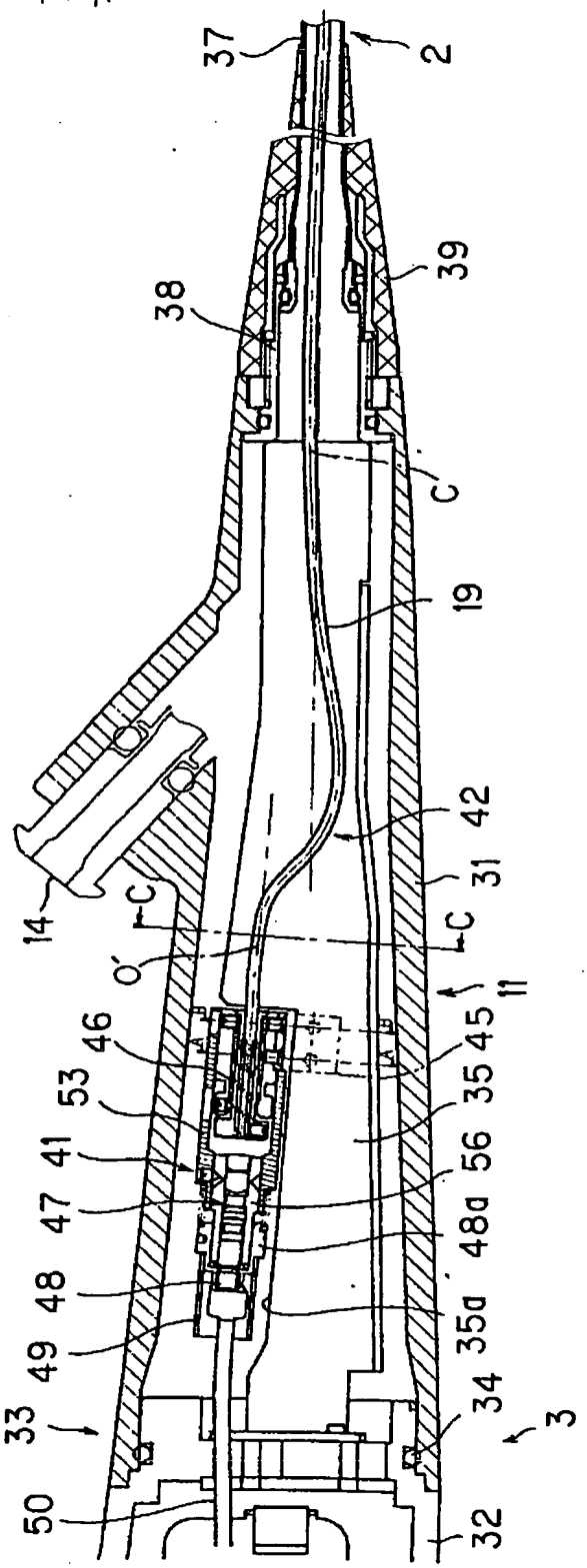


【図２】

FIG. 2

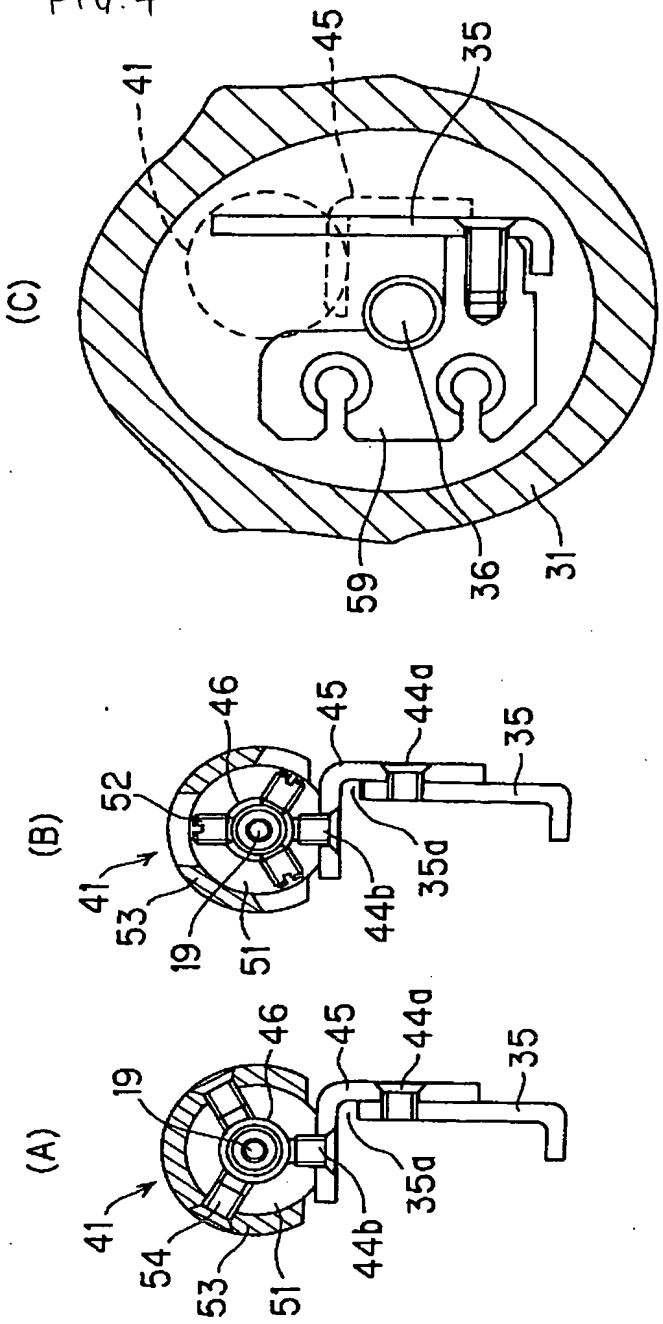


【図３】
FIG. 3


37
2
39
38
C'
19
42
31
14
C
C'
11
46
45
53
35
41
56
47
48a
48
35a
49
34
3
33
50
32

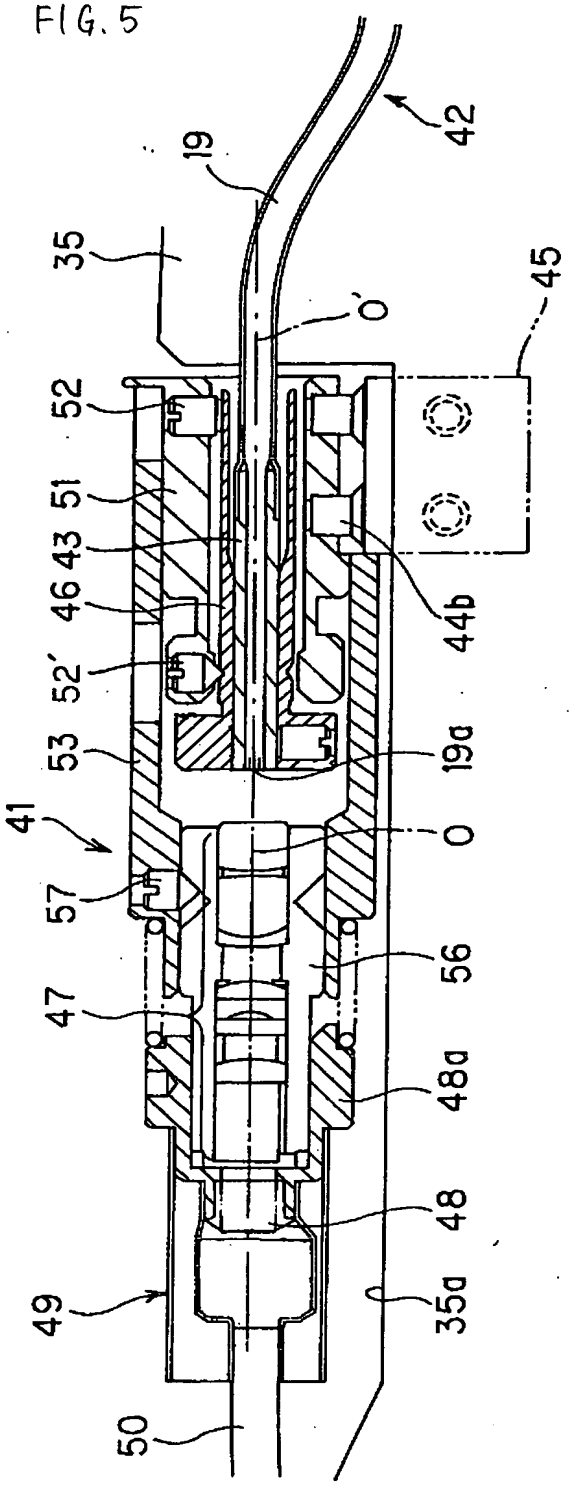
【図４】

FIG.4


(C)
41
45
35
59
36
31
(B)
46
45
44a
35
52
41
53
19
51
44b
35a
(A)
19
46
45
44a
35
41
54
53
51
44b
35a

【図５】

FIG.5



【図６】
FIG. 6